

concluded that one having ordinary skill in the art would have been motivated to modify AAPA based on the teaching of Chen et al. This rejection is traversed.

The Examiner's burden.

In denying patentability to a claimed invention based upon prior art, the Examiner must point to "page and line" of a reference wherein each feature of a claimed invention is asserted to reside. *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993). Indeed, as recently held by the Honorable Board of Patent Appeals and Interferences, the Examiner must not only point to "column and line of each relevant prior art reference", but must also explain how one having ordinary skill in the art would have interpreted each of the relied upon portions of the cited references. *Ex parte Gambogi*, 62 USPQ2d 2019 (BPAI 2001). That burden has not been discharged.

The Examiner merely asserts, "Chen et al. teaches in fig. 14... opposing to the corner of the alignment mark 3 which has a substantially square or rectangular configuration, ... wherein there is an outer metal layer formed outside of the metal layer 83..." (first paragraph on page 3 of the Office Action).

First, Applicants note that there is no "alignment mark 3" disclosed in Chen et al. This shows that the Examiner has not pointed to the "page and line" of a reference wherein each feature of a claimed invention is asserted to reside. *In re Rijckaert*, 9 F.3d 1531.

Second, Applicants submit that the reference number "3" corresponds to a "smaller box [which] must be formed in a separate photolithography step [within an outer box 2]" (column 1, lines 29-30). Chen et al. discloses what the "smaller box" is as

follows: "The inner box is a photoresist pattern 18 which will be used to protect portions of layer 15 during etching" (column 1, lines 49-51); "the inner box (photoresist pattern 53) is now in place;" and "With the outer box now formed, the top surface of layer 95 is coated with a layer of photoresist, which is then exposed and developed into pattern 123... This is the inner box..." (column 4, lines 24-29). As mentioned above, the Examiner appeared to assert that the "smaller box" or "inner box" is the "alignment mark," though Chen et al. does **not** provide any facts that the "smaller box" or "inner box" is the "alignment mark." The Examiner also appeared to assert that the "alignment mark" corresponds to a "recess" recited in claim 1. Applicants emphasize that the "alignment mark" does **not** correspond to a "recess" recited in claim 1, when reasonably interpreted in light of and consistent with the written description of the specification, which is the judicial requirement. *Dayco Products, Inc. v. Total Containment, Inc.*, 258 F.3d 1317, 59 USPQ2d 1489 (F.C. 2001); *Budde v. Harley-Davidson, Inc.* 250 F.3d 1369, 58 USPQ2d 1801 (Fed. Cir. 2001); *Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374, 53 USPQ2d 1225; *In re Cortright*, 165 F.3d 1353, 49 USPQ2d 1464 (Fed. Cir. 1999); *In re Morris*, 127 F.3d 1048, 44 USPQ2d 1023 (Fed. Cir. 1997). The recess in claim 1 is the one "formed in said first and second TEOS layers and exposing the surface of said semiconductor substrate, wherein the horizontal cross-section of said recess is substantially rectangular in configuration."

Further, Applicants submit that there is no "metal layer 83" in Chen et al. Therefore, Applicants have not understood what "an outer metal layer formed outside of the metal layer 83" is. Chen et al. mentions that a reference number 83 shows concentric

ridges which appears to be part of a oxide layer 17. (column 3, lines 53-54; and column 3, lines 61-column 4, line 5).

Accordingly, the Examiner is requested to discharge her burden by pointing to "page and line" of a reference wherein each feature of a claimed invention is asserted to reside. *In re Rijckaert*, 9 F.3d 1531.

There is no motivation.

In imposing a rejection under 35 U.S.C. §103, the Examiner is required to make a "thorough and searching" factual inquiry and, based upon such a factual inquiry, explain **why** one having ordinary skill in the art would have been realistically impelled to modify particular prior art, in this case AAPA's disclosing particular semiconductor device, to arrive at the claimed invention. *In re Lee*, 277 F.3d 1338, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002). Merely identifying features of a claimed invention in disparate prior art references does not, automatically, establish the requisite motivation for combining references in any particular manner. *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999); *Grain Processing Corp. v. American-Maize Products Co.*, 840 F.2d 902, 5 USPQ2d 1788 (Fed. Cir. 1988).

In applying the above legal tenets it is the exigencies of this case, it is apparent that the Examiner has **not** established the requisite motivational element. The Examiner has asserted that "the metal layers [disclosed in Chen et al.] are used for the disclosed intended purpose of providing a structure that makes the mark on the wafer easier to identify" (first paragraph on page 3 of the Office Action) and concluded as follows:

it would have been obvious to one of ordinary skill in the art to use a box-in-box configuration as the one taught by Chen et al. in the area

surrounding a test mark area as taught by the Applicant's admitted prior art for the disclosed intended purpose of improving the identification of the test mark in the wafer patterning (emphasis added) (second paragraph on page 3 of the Office Action) .

First, the Examiner appears to have misunderstood the claimed invention. The Examiner asserted that it would have been obvious for a person skilled in the art to modify AAPA to arrive at the claimed invention, based on the teaching of Chen et al. whose intended purpose is to improve the identification of the test mark in the wafer patterning. However, the claimed invention relates to "a semiconductor device having test mark which prevents extension of a crack arisen at the corner of a recess which is used as a test mark, thereby adverse affect to a semiconductor element by the crack is prevented" (emphasis added) (page 3, line 23 to page 4, line 2). The Examiner is therefore questioned: **Where** in Chen et al. discloses the motivation "preventing extension of a crack arisen at the corner of a recess" or **where** in the specification discloses the motivation improving the identification of the test mark in the wafer patterning. **Facts** are required. *In re Lee, supra*.

Second, AAPA admits that there is a problem that "[t]he cracks 27 extend outwardly and then destroy the semiconductor elements or another test marks (not shown) fabricated on the semiconductor substrate 21" (emphasis added) (page 2, lines 16-24). AAPA shows that cracks have been known as problem found in test marks. On the other hand, Chen et al. is directed to a box-in-box structure for detecting outer box readily during an alignment procedure (column 2, lines 58-65). Chen et al. is silent on the cracks found in test marks. It is apparent that the Examiner is simply attempting to press fit together two incompatible techniques. This approach falls far short of the

requisite "thorough and searching" factual inquiry mandated by the Court of Appeals for the Federal Circuit. *In re Lee, supra.*

It should, therefore, be apparent that a *prima facie* basis to deny patentability to the claimed invention has **not** been established for lack of the requisite factual basis and warranted the requisite realistic motivation. As long as no motivation to combine AAPA with Chen et al. is found, there is also **no reasonable expectation of success** which is the other element of *prima facie* case of obviousness.

All the claim limitations are not taught or suggested.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Applicants submit that AAPA and Chen et al. would not have suggested each and every limitation of claim 1. Applicants note that Applicants do not have an intention to admit the proposed combination of AAPA in view of Chen et al. is proper.

As shown in Figs.14A and 14B of the specification, the AAPA device includes test mark having a first insulating layer 22, i.e. a BPTEOS layer, formed on a substrate 21 with a second insulating layer 23, i.e., a TEOS layer, formed on the first insulating layer 22. A square recess 24 is then formed in the first and second insulating layers 22 and 23 to expose the semiconductor substrate 21 below (see page 2, lines 2-15). However, the AAPA does not teach or suggest a test mark having a metal layer formed on the first TEOS layer and opposing a corner of the recess, as the Examiner has admitted. Thus,

there is no issue as to whether AAPA does not teach each and every limitation of independent claim 1.

On the other hand, the device disclosed in Chen et al. comprises an outer box which is formed from a segmented trench comprised of a number of concentric ridges that project upwards from the floor of the trench. The segmented trench is overfilled with tungsten and the excess metal is removed. According to the disclosure of Chen et al., because of the presence of the ridges, the trench (i.e. the outer box) becomes easy to see when the inner box (which will be etched from a second layer deposited on the first one) is being positioned inside it. (see column 2, line 66 to column 3 line 11).

As discussed above, Chen et al. does not disclose the "alignment mark" 3, based on which the Examiner tried to prove that Chen et al. discloses a recess. Further, Chen et al. does not disclose a metal layer formed on the first TEOS layer and opposing a corner of the recess. The Examiner asserted that there is an outer metal layer formed outside of the metal layer 83 so that the outer metal layer opposes the corner of the alignment mark. As discussed above, there is, however, no "alignment mark" disclosed in Chen et al. Chen et al. discloses portions filled with tungsten between ridges 83, though Chen et al. does not teach or suggest usage of those portions. In addition, it does not teach or suggest that those portions are located a corner of a "recess" because Chen et al. does not disclose a "recess."

Therefore, consideration of the teachings of AAPA and Chen et al., either individually or in combination (assuming it is proper), would not have suggested each and every limitation of claim 1. In the instant case, the pending rejection has not established *prima facie* obviousness of the claimed invention as recited in claim 1,

because the proposed combination fails to satisfy the all the claim limitations standard required under §103.

The problem addressed and solved by a claimed invention.

Furthermore, it is well settled that the problem addressed and solved by a claimed invention must be given consideration in resolving the ultimate legal conclusion of obviousness under 35 U.S.C. §103. *North American Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993); *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir. 1990); *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989); *In re Nomiya*, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).

The present invention addresses **not only** the crack problem, **but also** problems of not measuring the thickness of the TEOS and not determining overlay accuracy (page 3, lines 12-20). Both AAPA and Chen et al. do not address those problems, and of course, do not provide any solutions on them. Accordingly, under the circumstances of this case, the problem addressed and solved by the claimed invention constitutes a potent indicium of **nonobviousness**.

Dependent claims 2-8.

If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Accordingly, as claim 1 are patentable for the reasons set forth above, it is submitted that dependent claims 2-8 which respectively depend from claim 1 are also patentable. The Examiner's additional comments with respect to the claims do not cure the argued fundamental deficiencies of the proposed combination of AAPA in view of Chen et al.

Applicant traverses the rejections of those claims and solicits withdrawal thereof.

Conclusion

Based upon the foregoing, Applicants submit that the Examiner has **not** established a *prima facie* basis to deny patentability to the claimed invention for lack of the requisite factual basis and want of the requisite realistic motivation. Further, upon giving due consideration to the **problem** addressed and solved by the claimed invention as an indicium of non-obviousness, the conclusion appears inescapable that one having ordinary skill in the art would **not** have found the claimed invention **as a whole** obvious within the meaning of 35 U.S.C. §103. *Jones v. Hardy*, 727 F.2d 1524, 220 USPQ 1021 (Fed. Cir. 1984).

Applicants, therefore, submit that the imposed rejection of claims 1 through 8 under 35 U.S.C. §103 for obviousness predicated upon AAPA in view of the Chen et al. is not factually or legally viable and, hence, solicit withdrawal thereof.


To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this

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paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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